The Sidereal Messenger.

Conducted by Wm. W. PAYNE, Director of Carleton College Observatory, Northfield, Minn.

"In the present small treatise I set forth some matters of interest to all observers of natural phenomena to look at and consider."—GALILEO, *Sidereus Nuncius*, 1610.

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WORK IN THE ENGLISH OBSERVATORIES.

The following is a brief account of work done in foreign observatroies, during the last year, which, it is thought, will be interesting to American Astronomers:

Royal Observatory, Greenwich. Under the head of meridian observations, about 1550 stars were observed in 1883, and special pains were taken to secure at least two observations of each of these in the year. Whole number of transits observed were 5318, and of circle observations 5180.

The mean error of the *Moon's* tabular R. A., from 100 observations with the transit circle is +0.^{s}03. Prof. NEWCOMB'S corrections to HANSEN'S *Tables de la Lune* having been applied in forming the tabular places in the Nautical Almanac. The mean error in 1882, when HANSEN'S tabular places, uncorrected, were used was +0.^{s}82.

Five determinations of the flexure of the transit circle show a mean resulting value of −0.″49, and is larger than usual. The discordance between the nadir observation and the mean of the results from reflection-stars, north and south of the zenith, was 0.″45, a slight increase on the previous year.

The equatorials were employed for the usual extra-merid-

ian observations on comets *a* and *b*. Micrometric measures of the positions of five of the satellites of *Saturn*—*Tethys, Dione, Rhea, Titan and Japetus*—have been made; no satisfactory observations of the fainter satellities being secured. Measures of one of the satellites of *Uranus* (*Titania*) were obtained on one night; also some comparisons of *Polyhymia* with neighboring stars, and fourteen nights of observation of double-stars with the double-image micrometer. Nine occultations of stars by the *Moon*, and 37 phenomena by *Jupiter's* satellites are recorded.

The spectroscopic observations with the half-prism on the S. E. equatorial have been on the displacement of the F, *b*, or D, lines in 46 stars, the total number of measures being 309. The chromosphere of the *Sun* has been examined on 25 days, several prominences being seen each day, and the spectra of various *Sun*-spots on eight days. The spectra of comets *a* and *b* and of star, γ *Ceti* were observed. The existence of bright lines as supposed by Dr. KONKOLY was not confirmed.

Photographs of the *Sun* have been taken on 221 days of 1883, as against 201, in 1882. Increase is partly due to finer weather, and partly to the use of dry plates instead of wet. *Sun*-spot activity, in number and area, shows no decrease in the year 1883, from that of 1882, although in the appearance of faculæ there is a decided falling off. One hundred and forty-two Indian photographs of the *Sun* for the year 1882 have also been measured and completely reduced, making a total for that year of 343.

The volume of Greenwich Observations for 1881 was distributed in June last, and the printing for the astronomical portion of the volume for 1882 is nearly complete.

Armagh Observatory. During last year most of the time has been taken up by the preparation for the press of the Second Armagh Catalogue of 3000 stars. It is expected that the printing will commence soon.

Cambridge Observatory. The total number of meridian observations is 2289, including 248 observations of clock

stars, 69 observations of *Polaris* above the pole requiring 164 circle readings, and 70 below the pole requiring 166 circle readings; and 1902 observations of Zone stars.

The error of collimation was determined 180 times, and the level error and nadir point were each determined 169 times.

An extensive series of observations has been made for the purpose of testing the accuracy of the divisions of the West Circle, which has been used throughout the Zone observations.

The standard star observations have been reduced to the end of 1881, in R. A. and N. P. Distance. The reduction of the observations of 1882 and 1883 are far advanced.

Dunsink Observatory. The meridian circle observations show that R. A. of 437 stars and declination of 474. All have been reduced to their apparent places for date of observation, and the work of reducing to mean places has begun.

Observations of 280 standard stars were taken for determining the right ascensions, the zero of declinations being on every occasion determined by nadir observations from a mercury trough. Part V of the Dunsink Observations is going through the press.

Kew Observatory. The sketches of *Sun*-spots as seen projected on a photo-heliograph screen have been made on 214 days, in order to continue SCHWABE'S enumeration. The *Sun* was found to be free of spots on seven of those days.

The corrections to the area-measurments for fore shortening has been applied to the reduction of *Sun*-spot observations for the last two years, under the direction of Mr. D. LA RUE. The whole series is in the possession of the Royal Society, and is now being revised and arranged for reference by Mr. MATH.

It has been decided to make a trial of watch-rating, and an apparatus has been fitted up for doing this kind of work at extreme temperatures. It is expected that operations will commence soon. The usual magnetic and meterological observations have been carried on as formerly.

Liverpool Observatory. Besides meteorological work, attention has been given to improvements in chronometric navigation. Records of 100 voyages from Liverpool to the west coast of S. America and back again, have been received and discussed at this observatory. The rates of all the chronometers employed were corrected for the change of temperature in accordance with the mean temperature obtained daily at sea. As each ship carried three chronometers, there are three hundred cases in which the daily rates at sea were obtained for an average voyage of 105 days. The average difference between the predicted daily rates and the rates actually made at sea was 0.37 of a second of time. In one hundred out of three hundred cases, the average difference between the predicted rates and the rates made at sea; was only 0.08 of a second of time. The thermal errors of all the chronometers were in the first instance carefully determined at Bidston. When so determined, it is claimed that chronometers will carry on the true time as accurately for a period of three or four months, as will astronomical clocks on the shore; but when rates are not corrected for temperature, their errors at sea are increased in the proportion of about four to one.

Radcliffe Observatory. Transit circle for 1883 are:

Transits	2604.
Circle Observations, (for each the reading of four miscroscopes)	2448.

These totals include:

Observations of the *Sun*	54.
" " " *Moon*	53.
Reflection Obs. of the stars	96.

Eleven observations of occultations of stars by the *Moon*, and 45 phenomena of *Jupiter's* satellites have been made with the extra-meridional instruments.

Oxford University Observatory. The expedition to Abbasseeyeh, near Cairo, Egypt, for stellar photometry, during last year from Oxford observatory was successful,

as the following results show: The climate during the winter and spring months is equable in Egypt beyond anything known in Europe. This was shown by the fact that 3385 extinctions of stars were made at Cairo, with the wedge photometer, while only 997 were made at Oxford in the same time. The absorption of stellar light by the atmosphere was equal to $0.^m187$ sect. Z. D., while at Oxford it was $0.^m253$ sect. Z. D., indicating as might be supposed, a superiority of transparancy in the Egyptian atmosphere. Still this superiority is not so important as it appears at first sight, for the visibility of stars in Egypt differs from that in England, at an altitude of 30° by only one-fifth of a magnitude; but in the former place photometric work can be carried 15 degrees lower than in the latter. Recently Dr. MULLER of Potsdam, has also made a determination of the absorptive power of the atmosphere; and he finds that $0.^m201$ sect. Z. D. fairly represents it. The general conformity of all these results, from BOUGUER and SEIDEL to the present day, is gratifying and remarkable.

Photometric measures of all the stars brighter than the fifth magnitude, from the Pole to a little beyond the Equator have been completed and published by the Society in Vol. XLVII of their *Memoirs*. Photometric measures of all the remaining stars, contained in Argelander's *Uranometria* are now being made. This is the first complete attempt of the kind in England.

The measurement of the relative co-ordinates of forty stars of the *Pleiades* has been completed, with the duplex micrometer (together with their photometric magnitude,) with a view of discussing their proper motions, and their grouping into a single system. This memoir will probably be ready this month.

Temple Observatory, at Rugby, during the year 1883 measured 109 double-stars. The results of the last three years of work have been reduced, and are being prepared for printing.

Stonyhurst College Observatory. *Sun* observations are

one of the chief lines of work at this observatory, and results have been obtained on 202 different days. The large pictures of the whole solar surface are 185 in number.

Ealing.—In Mr. A. A. COMMON'S observatory during the past year, attention has been given chiefly to photography. "Negatives of several nebulæ have been obtained, including a series of the Great Nebula in *Orion*." He has continued the same method of making long exposures as was used in 1882. Results favorable beyond expectation have been realized. He uses a reflecting telescope, mirror three feet in diameter and made by Mr. CALVER with an unusual mounting. To avoid friction, the moving parts are floated in mercury. By improving the driving clock of his instrument and securing the most sensitive plates, he has succeeded in bringing out minute details in the photographs of nebulae that are difficult to see, and quite impossible to represent by drawing. He finds the extreme limit of useful exposure has not been reached in $1^h\ 30^m$. In thirty-seven minutes stars such as LASSELL'S *a* and *b* mentioned in Professor HOLDEN'S Monograph of the central parts of the nebula of *Orion* are distinctly shown. The value of this work in so important a field can not be overestimated and the success which Mr. COMMON has attained to in it, was duly rewarded by the Royal Astronomical society in presenting him its gold medal.

Dun Echt—At the observatory of the Earl of Crawford attention, has been given to the distribution of comet news. Fifteen circulars referring to comets were printed and widely circulated during the year. In August last, this observatory secured a large grating from Professor ROWLAND of Baltimore, the ruled surface being $5\frac{1}{16}$ by $3\frac{1}{2}$ inches, and having 14,438 lines to the inch. Collimating and view telescopes of four inches aperture and a power of 120 bring out magnificently the spectra of the second order. The duplicity of line D_2 was noticed, and that of D_1 suspected, independent of Prof ROWLAND'S separation of the same. December 14, the strong line wave

length 588.32, which was observed double on the *Sun's* following limb was single on the preceding limb, one component being due to iron in the *Sun's* atmosphere, and the other probably due to aqueous vapor in our own. The displacement of the former was due to the *Sun's* rotation on its axis.

During the summer Dr. COPELAND was at Vincocaya, South America which is 14,360 feet above the sea. At this point he detected several close double-stars, *ι Muscæ* and *H Velorum* being among the number. The chief gain to observation at this altitude Dr. COPELAND thinks was in the transparency of the air, some idea of which may be known by the visibility of *Sirius* and *Canopus* to the naked eye before sunset. On this account several minute planetary neublæ were discovered by attaching a prism to the eye-piece of the telescope as recommended by Professor PICKERING.

[*To be continued.*]

INTRA-MERCURIAL PLANETS.

H. HARRISON.

In No. 24, page 113 of MESSENGER, appears an article by Prof. G. DAVIDSON, headed as above. I had some time ago prepared an article to the same effect, and, being unfinished, will discard same now, and instead, ask the discoverers of the supposed "Vulcan" a question, which I should like to have those gentlemen answer. There is no doubt in my mind that a number of gentlemen started to observe the solar eclipse of May 6th, 1882, with the sole purpose in view to discover, or better search for "Intra-Mercurial Planets," and it seems very strange to me that they will travel thousands of miles with tons of apparatus, and leave at home a feather-light article, like a star chart or a catalogue. When an astronomer searches for comets and picks up a faint nebulosity object, resembling a comet, and, if he entertains

any doubt as to its nature, he at once turns to his circles for the Right Ascension and Declination of the object; if, for instance a supposed comet should be picked up under R. A. 16^h 44^m Decl. N. 47044′—the catalogues will settle the doubt at once, as under this position is recorded the planetary Neb. 4244 in Sir. J. HERSCHEL's Catalogue. I have settled such doubts more than a hundred times. Why did not M. TROUVELOT do so? Now would it have been difficult, with other preparations begun months prior, and for the purpose of observing an eclipse—to procure a small equatorial stand with graduated circles and verniers, reading to $10^{s.h}$ of time and 4′ of arc, and driven by a small clock-work, of ever so inferior quality, and on arrival at the place selected for observation, place same in position, an operation which requires but little time and skill? Equipped with such modest means, there ought not to be a shadow of a cloud entertained whether—a conspicious star like *δ Arietis* observed during totality, and its R. A. and Decl. is read by an assistant, and instantly recorded—is one known to the observer—catalogued in books and charts, or a newly discovered stranger.

I believe many observers will share with Prof. DAVIDSON the opinion that the object seen by Prof. TRAUVELOT and others, was no more or less than *δ Arietis*, and is remarkable that so "scientific" a gentleman as Prof. TRAUVELOT should be induced to believe he had found an intra-Mercurial Planet, without knowledge of *position, disc* or *sensible phase*, and with no other evidence but the fact that it was a *red star*.

Jersey City Heights,
May 6th, 1884.

The Sun, by Prof. C. A. YOUNG, (one of the International science series) has been translated into Russian, as well as into French, German and Italian. In England eight thousand copies have been sold. And it has been very favorably received in this country.—*Science*.

NOTES ON THE PONS-BROOKS' COMET.

BY H. C. WILSON.

The following notes are given just as they occur in my observing book, except that the measures are corrected and sidereal times are reduced to mean solar. I have also inserted some explanations in brackets. The instruments employed were: The 11-inch equatorial, with eye-pieces magnifying 90, 150, 230, and 450 times; the 2½-inch finder of the equatorial, magnifying power 30; an opera-glass, magnifying power 2.5. The eye-piece 90 was generally used with the equatorial.

September 5, 1883.—10 to 10:30. Comet was so faint that scarcely any illumination of the micrometer wires was possible.

Sept. 6.—9:15 to 9:45. Comet very faint.

Sept. 10.—13:55 to 14:55. Comet very faint, but condensed in the center. Transits were a little uncertain. Could not see it near the wires with the least illumination. Not visible in the finder.

Sept. 26.—8:30 to 9:40. The comet is much brighter than it was on the 10th. Easily visible in the finder. Has no tail. It is nearly round, strongly condensed in the center, and I thought I could see at times a distinct nucleus of about the ninth magnitude, but was not certain.

Sept. 28.—9 to 10. The nucleus was not distinct, so that it was hard to get the exact times of transit. At times there seemed to be two condensations.

Oct. 8.—8:05 to 8:40. Comet faint in moonlight, but nucleus visible,—equal 9th magnitude star, *Moon* at first quarter.

Oct. 30.—8:15 With power 90 the nucleus is nearly equal in brightness to star *b* [an anonymous star, estimated magnitude 9.5.] A short tail is suspected, but not certainly seen. With power 450 the nucleus is at least one magnitude fainter than star *b*, but is longer. Part of the tail can be seen. [A pencil sketch shows a hazy nucleus, surrounded by an oval coma, and a short spreading tail. The star *b* is placed just at the apex of the head.]*

Oct. 31.—8 to 9. Appearance of the comet is the same as last night.

Nov. 1.—9:30 to 10:10. Appearance not perceptibly changed from last night. With power 450 the nucleus does not appear at all stellar, but is very dense in the center.

Nov. 2.—8:50 to 9:20. [Position observed but no notes, therefore nothing peculiar.]

Nov. 12.—7:55 to 8:25. Comet is very faint in moonlight. Strongly

*Sketches referred to on pages 137, 138, 140 and 141 will be found on page 139.

condensed in the center, so that its position can be quite accurately determined.

Nov. 16.—7:05 to 7:25. [No notes.]

Nov. 17. 7:00 to 7:30. Nucleus almost stellar, tenth magnitude. Coma round, fading equally in all directions from the nucleus.

Nov. 19.—7 to 7:35. Comet is a little brighter than on the 17th, and shows more of a tail. The nucleus is dense and almost stellar in appearance. Looked at comet with powers 230 and 450, but could not see it distinctly. Sky a little hazy.

Nov. 24.—9 to 10. Comet is in a group of three stars. [A sketch made with power 90, shows a bright nucleus, round coma, and short faint tail. The three stars are: a=Dm 48° 2652, b=Dm 48° 2655, c=Dm 48° 2651. Magnitudes 6.5, 7.5 and 8.3.] In the finder nucleus is, about as bright as c. In power 90, it is much fainter than c, not brighter than a 9.5 magnitude star. Coma round, bright, fading gradually from the nucleus. Tail is plainly visible to star a. Looked at comet with power 450, but sky being a little cloudy, I could not make out much. The nebulosity is very bright close to the nucleus.

Nov. 26.—7 to 7:40. Comet is considerably brighter than on the 24th. In the finder it is brighter than the comparison star, [Dm 47° 2608 (8.0 mag.)]. It is equal to star b [Dm 48° 2669 (6.7 mag.)] in brightness. With power 450, the nucleus seems a little elongated in approximately the direction of the tail. The nebulosity is most abundant in P. A. 150° roughly.

Nov. 27.—7:40 to 8:50. Comet is of about the same brightness as last night. I examined the nucleus with powers 90, 150, 230 and 450. Nucleus is stellar with each. With 450 it is a little blurred, but much brighter than the surrounding nebulosity. [A sketch with power 450 shows the apex of the head indented.] The apex is certainly not round. The outlines can only be seen by moving the telescope back and forth. Both nucleus and coma seem to change frequently in brightness. Nucleus is very minute, not more than 12th magnitude. At times the nebulosity close to it becomes so bright as to make it appear equal to 9th magnitude. With power 90 nucleus is larger and brighter, equal 9.5 magnitude, and at times 9th magnitude. P. A. of the bright streak in the tail 25°.1.

Nov. 28.—6:50 to 8. Estimated magnitude of nucleus, power 90, 10.0. P. A. of right edge of tail 17°.2 roughly. Right edge can be distinguished to diameter of field [18′], by moving telescope in right ascension. Left side cannot be seen more than ⅓ as far from the nucleus. Outline is about the same as last night. The apex is not convex. [A sketch with power 90 shows three parts to the tail: the first bright and narrow, of about the same width as the coma, the second enveloping the first, and four or five times


OCT 30
NOV 24
NOV 27
DEC 3
DEC 4
DEC 21

broader, faint but distinctly visible, the third enveloping the second and only seen with averted vision or by moving the telescope. The apexes of the second and third parts are indented.] There is an 11th magnitude star very near the nucleus. It's light is not at all dimmed by the coma. With power 450 there is a faint stellar nucleus, as on last night. The nebulosity is fainter, owing to the haziness of the sky. It appears to be densest in about P. A. 240°.

Nov. 30.—7:10 to 7:40. Comet is brighter than on the 28th. Tail can be distinguished to one diameter of the field of the finder. The outlines of the head, with power 90, are the same as on the 28th. I am not so sure of seeing the faint outer curves as then. With power 450 the nucleus is stellar and the nebulosity fades away from it equally on all sides. P. A. of wires parallel to right side of tail, power 90, 29°.2. Clouded up suddenly.

Dec. 1.—7:15 to 8:35. Comet is about the same in brightness as on last night. Tail can be traced to nearly one diameter of finder. Outlines of brighter part in power 90, are the same as on the 28th. The fainter outlines cannot be certainly seen. I think there is faint nebulosity extending toward the *Sun* to about 6′ from nucleus. This is so faint as to be very uncertain. It can only be seen by moving the telescope in right ascension. P. A. of wires parallel to right side of tail 32°.4. Estimated magnitude of nucleus 9.5.

Dec. 3.—7:15 to 8:10. Comet is visible to naked eye. I saw it also last night with naked eye. Tail can scarcely be seen at all in the finder, however, moonlight, and sky a little hazy. [A sketch with power 90, shows the outlines of the head similar to those on Nov. 28th, with also an extension of light toward the *Sun*.] A very faint extension can be seen toward the *Sun* to about ⅓ the diameter of the field. Nucleus is stellar with powers 90 and 230. Blurred with 450. It is much brighter than the nebulosity immediately surrounding it. No indication of jets yet. With 450 the outlines are the same as with 90. P. A. of brightest part of tail 31°.7. Very uncertain as I cannot illuminate the wires and see the tail distinctly at the same time. There is no good comparison star near enough to measure position.

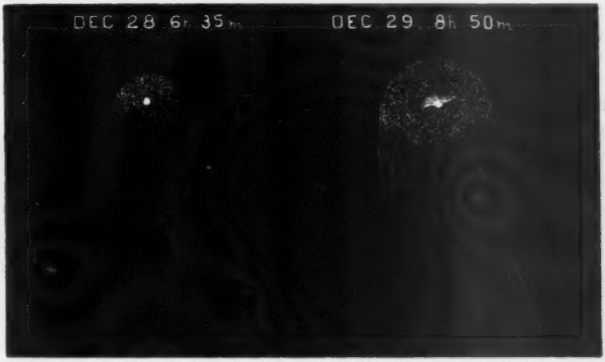
Dec. 4.—6:50 to 8. Nucleus brighter than on last night, and still stellar. Tail can scarcely be seen at all, on account of the moonlight. P. A. of brightest part of tail 34°.2. With wires slightly illuminated, power 90, the appearance was something like this [Sketch shows the inner and brighter parts of the tail.]

Dec. 5.—7 to 7:40. P. A. of right edge of tail 40°.2.

Dec. 8.—7:20 to 7:50. No notes.

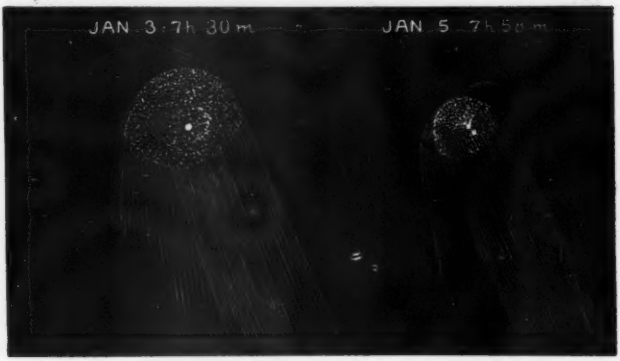
Dec. 11.—7:05 to 7:50. In the finder the comet is brighter than the comparison star, [Dm 42° 337 (6.8 mag.)]. In power 90, the nucleus is very minute, but bright like a star, about 10th magnitude.

Dec. 21.—8:10 to 9:30. Nucleus is 1 magnitude brighter than star *b* [Dm 35° 4157 (9.5 mag.)] in power 90. With 450, nucleus and *b* are nearly equal in brightness, but nucleus has twice as large a disc as star. P. A. of tail with nucleus at edge of field [18′], power 90, 31°.1. width 300″. [The sketch shows that these measures were of the brighter portion of the tail.] Outer curves could not be seen with illumination, power 90, or with power 450. 9:30.—The nucleus will soon pass near a 10th magnitude star. The latter is now in the coma just east of the nucleus, and is visible with power 90, whether on account of the haze of the comet or that of the sky near the horizon. I cannot tell. With 450 the star is yet visible. The nucleus seemed at first to leave a slight pink tinge. It is now almost straw color. There are no jets. In the finder the tail can be traced to nearly one diameter of the field of view [1°.5], and is perceptibly curved, being concave on the right side. That side is much better defined than the left.



Dec. 28.—6:30. [A sketch with the finder shows the tail extending to and a little beyond the star, Dm 29° 4419. Slightly convex on the right side. Nearly uniform in width, except near the head where there is a short faint projection on the left side.] The tail is not yet plainly visible to the naked eye. In the finder I can trace it to two diameters of the field [3′]. In power 90 I can trace it to five diameters [90′]. The nucleus is brighter than any of the stars in the field of the finder, but not quite so bright as *Zeta Cygni*. The nucleus seems of a pink or fire color with power 90. With higher powers the color seems less brilliant, but still is quite noticeable. With 450 the nucleus has a perceptible size, but is quite hazy, although very distinct from the surrounding nebulosity. P. A. of tail with nucleus at the edge of the field, power 90, 40°.7. 6:35.—[Sketch of the head.]

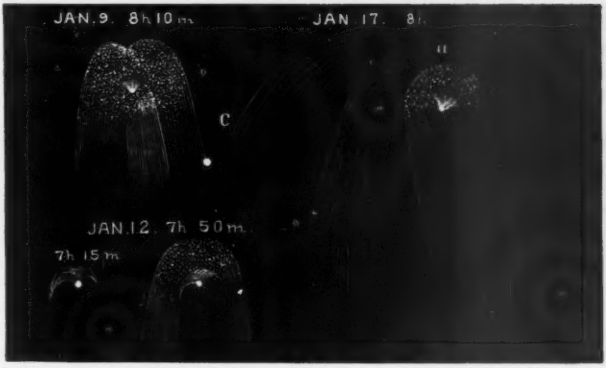
Dec. 29.—7:30 to 9. The nucleus is larger but not quite so bright as last night. A fan is visible toward the *Sun*. This has no well defined boundaries, but seems to be continually changing,—flashing out sometimes to the heighth of 1′ or more, then again almost invisible. The nucleus is pink or flesh color, less brilliant than last night. With power 450 the nucleus is large and very hazy. With the finder it is brighter than any of the stars in the field of view. 8:00.—[A sketch with the finder shows the tail to a length of two diameters of the field (3°). Slightly convex on right side. Passes centrally over stars Dm 27° 4104; Dm 28° 4140 and Dm 28° 4147]. Could be traced nearly two diameters farther before clouds came over. 8:50.—[Sketch with power 90]. P. A. of wires including bright part of tail, with nucleus at edge of field, 40°.7. [A sketch with the opera-glass shows the tail very narrow, slightly curved toward the north, the south edge grazing the stars *Pi Cygni* and 31 *Pegasi* and extending a little to the north of *Pi Pegasi*.] This sketch is drawn from memory, the sky having clouded over. To the naked eye the head of the comet seemed midway in brightness between *Zeta Cygni* and *Kappa Pegasi*, With the opera-glass the comet was equal to *Zeta Cygni*. With the eye the tail could be traced to 31 *Pegasi*, and with the opera-glass to a distance equal to that of *Pi Pegasi* from the nucleus.



January 3, 1884.—7:15 to 8. [A sketch with the finder shows the tail broader but shorter than on the 29th. The right (*i. e.* south edge) extends to the star Dm 20° 5103. Sketch with power 90 shows the outlines of the head similar to those on the 29th.] P. A. of bright part of tail 37°.2. Estimated magnitude of nucleus 7.5. The sky was quite hazy and the *Moon* shining brightly, so that but little of the tail could be seen in the telescope, and the limits of the head as sketched

are quite doubtful. The nucleus had the same appearance as when last observed, a slight pinkish tinge of color. There was no fan or jets, and the nebulosity seemed to fade off gradually and equally in all directions. The bright part of the tail was narrower than the coma, giving the head a bulbiform appearance at moments, when the fainter parts could not be seen. The nucleus and the comparison star seem to be about equal in size, but the light of the star is much more intense, and whiter than that of the nucleus. With powers 230 and 450, the nucleus is enlarged, but no definite disc is revealed. It is very much brighter than the nebulosity immediately surrounding it. To the naked eye the comet appears as a star a little fainter than *Zeta Cygni*, and brighter than *Kappa Pegasi*. At 6 P. M. I looked at the comet with an opera-glass, and could trace the tail to *o Pegasi*, and perhaps a little beyond. A slight curvature was noticeable, the left (south) side being convex.

Jan. 5.—7:20 to 8:30. $7^h\ 58^m\ 7^s$. The nucleus is within 5″ of a 9.5 magnitude star, but will not occult it. P. A. of middle of fan 238°.2. P. A. of brightest part of tail 24°.2. Comet is faint in moonlight. Nucleus is very bright. There seems to be a stellar point within it, and a faint fan or brush of light in the above P. A., and about 100° wide. Nucleus is pink color and the fan pinkish. Coma is very faint; bluish



drab color. In the finder the tail is very faint, and can be traced scarcely more than one diameter of the field. Nucleus is brighter than any of the stars in the field of view. [Sketch in finder shows the tail much broader than before. Extends to the stars Dm 16° 4727 and 4728. Sketch with power 90 shows three parts of the head similar to the sketches on preceding nights.] This sketch was drawn from memory after leaving the dome. The star, although passing so near

the nucleus, did not grow perceptibly fainter. With power 450 I estimated the shortest distance between the star and nucleus at 5'. With this power the nucleus was quite large and blurred. The fan seemed to be flashing and varying continually, but its central direction was apparently constant, and at a considerable angle with the direction of the tail. To the naked eye the head of the comet appeared equal in brightness to *Lambda Pegasi*. The tail was invisible, except near the nucleus.

Jan. 9.—7:15 to 8:15. [Sketch with opera-glass shows the tail extending ¼ its length beyond *Sigma Pegasi*. The north edge just grazethat star.] Comet is fainter than *Zeta Pegasi*, equal to *Xi Pegasi*, and brighter than *Rho* or *Sigma Pegasi*. 7:32.—P. A. of brightest part of tail, power 90, 35°.7. P. A. of middle of fan 219°.8. Estimated magnitude of nucleus 7.0. [Sketch with power 90.] With higher powers scarcely anything can be seen but the nucleus, and that is blurred and indistinct. In the finder the tail cannot be traced at all, although the nucleus and coma are bright. The sky is quite hazy and the moonlight bright.

Jan. 11.—7 to 8. Sky hazy and moonlight bright. Tail of comet cannot be seen at all, with either naked eye or telescope. There seems to be a very faint "fan" which flashes out one moment and is invisible the next. It is impossible to determine its direction accurately. It is of course on the side toward the *Sun*. Nucleus is bright and planetary in appearance. P. A. of tail, power 90, 40°.7. This is little better than an estimate. It was obtained by turning the light off and fixing in my eye the direction of the tail, then suddenly turning the light on and putting the wires in that direction. Three other measures in the same manner give: 36°.4. 40°.4, 36°.4. Wires moved in opposite direction for each successive measure. With powers 230 and 450 the nucleus is not stellar, but is still quite small. The coma is round and fades off almost equally in all directions. The light is a little stronger on the side toward the *Sun*. The nucleus is pinkish in color, while the coma is almost blue.

Jan. 12.—7:10 to 8:10. P. A. of middle of fan, power 90, 225°.0. Sides can be seen to re-curve to-night for the first time. [Sketch shows only the fan.] This much can be seen plainly, with moderate illumination. 7:50.—P. A. of bright part of tail 27°.7, 27°.7, 30°.0, 27°.0; taken in the same manner as on last night. P. A. of right edge of tail 37°.7. [Sketch shows the brighter part of the head.] The visible diameter of the head is not more than 3', and the length of the tail, easily seen, not more than 8'. In the finder the tail cannot be traced to any star, The nucleus is brighter than any star in the field of view. With power 90, the nucleus is equal in magnitude to the comparison star [Dm 2°, 4619 (8.2 mag.)] but its light is much less intense. With power 450,

nucleus is much fainter than the star, but apparently of about the same size. The fan and coma are almost invisible. To the naked eye the comet equal to *Gamma Piscium*. In the finder it is at least one magnitude fainter than this star.

Jan. 13.—6:10. [Sketch with opera-glass shows the tail extending to a point about 1-5 distance from *Iota Piscium* to *Zeta Piscium*.] Comet equal in brightness to *a Pegasi*. Tail can hardly be seen beyond 12 *Piscium*.

Jan. 17.—8 to 8:15. The head was much brighter than hitherto. The faint outer curves could be seen distinctly. The bright part appeared a little wider and brighter than usual. The fan was bright but not re-curved. Its central direction was not exactly opposite that of the bright part of the tail, but was turned at least 45° to the right. [Sketch drawn from memory on the morning of the 18th.]

Jan. 21.—7 to 8:10. [Sketch with opera-glass shows the tail extending to 44 *Ceti*. Convex on south side.] Comet equal *Tau Ceti* in brightness. [Sketches with power 90, show a great change in the appearance of the head. The bright part has increased in width and brilliancy, and the faint outer curves are entirely invisible.] 7:17.—P. A. of axis of tail 64°.2 P. A. of brightest direction of fan 20°.2. Distance of apex from nucleus 116″. Distance from nucleus to right side of head 204″. Distance from nucleus to left side of head 215″. One half of the width of the tail, opposite the star *Lalande* 46929, 304″. 7h 34m 0s.—The star is now just in the edge of the tail; power 230. 7:56.—[Sketch with power 230 shows the fan less distinctly, and the head is more flattened.] With power 230 the nucleus seems more hazy than with 90, but there is a small bright point in the center. Power 450 produces a similar effect. With 90, the whole head is quite

brilliant, nearly even in all parts except the fan. Perhaps the axis of the tail is a little the brightest, but very little. The nucleus has a flesh color. 8:08.—[A sketch in the finder shows the tail extending to the star *Weisse* 23h 1228.]

Jan. 22.—6:55 to 7:30. [Sketch in finder shows the tail extending to a point about ¼ distance from *Weisse* 0h, 12 to 46.] Through thin clouds. With power 90, the appearance is quite different from last. The central part of the tail is by far the brightest. The fan is scarcely visible. I can see that it is there but cannot define its outlines. 7:08.—Clouded up. 7:25.—Break in clouds. Middle direction of fan 218°.7. Bright part of tail 72°.7. Cloudy again.

Jan. 24.—6:34. [Sketch with opera-glass shows the tail extending to 35 *Ceti*.] 6:48.—[Sketch with finder; tail extends over star. *O. Arg. S.* 133 to *O. Arg. S.* 148.] 7:01.—The fan is quite indistinct, owing to the haze and smoke over the city. The nucleus is almost white, and a blaze of pink light seems to flash out opposite the bright part of the tail. The head fills the whole field of view, power 90. The outlines are similar to those on the last night observed. 7:11.—P. A. of bright part of tail 62°.7. P. A. of right edge 81°.2 P. A. of left edge of bright part 63°.7. P. A. of left edge of tail 28°.7. Middle direction of fan 230°.9; determined with bright illumination. 7:20.—[Sketch with power 90.] Sky is clear at intervals. 7:50.—P. A. of bright part of tail 64°.7. Central direction of fan 218°.8.

Jan. 25.—6:50. [Sketch with opera-glass; tail extends to 57 *Ceti*, passing over *O. Arg.* S. 343 and 397.] Comet midway in brightness between β and η *Ceti*. 7:12.—[Sketch with finder; tail extends to stars W. M. C. Z. (206) 47 and *O. Arg. S.* 198.] 7:17.—[Sketch with power 90; appearance similar to that on the preceding night.] P. A. of middle of fan 211°.7. Right side of tail 74°.7. Middle of tail 58.2.

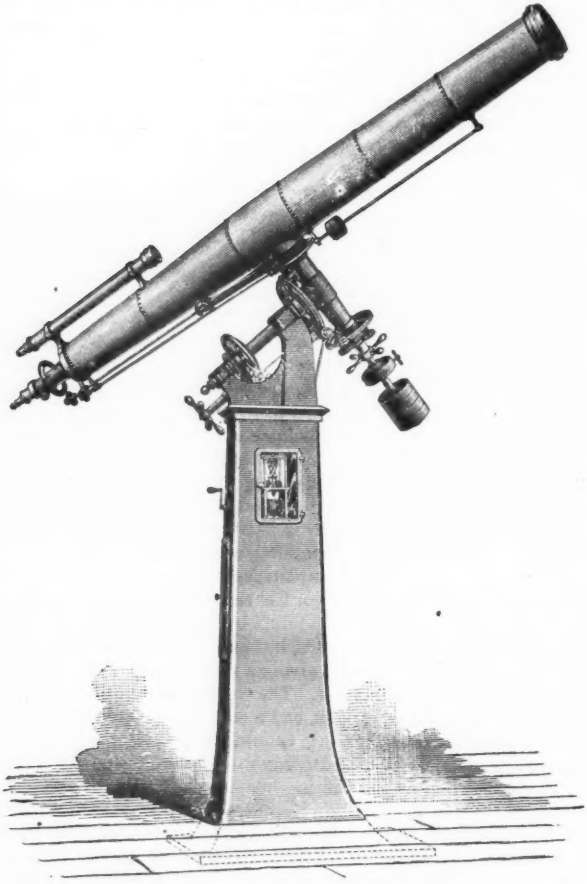
Jan. 26.—6:59. [Sketch with finder; tail is only traced two degrees. Sketch with opera-glass;tail extends to 61 *Ceti.* The axis passes over 33 *Ceti.* The north edge touches *Beta Ceti.*] Faint in haze. Nucleus is distinct however. 7:36.—P. A. of tail 79°. No fan is visible.

Feb. 1.—6:55 to 7. Too indistinct in haze, near the horizon. The nucleus is bright but blurred. Before commencing the position observation, I traced the tail 4° or 5° with the opera-glass. In the finder the tail is very faint, and can be traced only ½ diameter of field. In the large telescope the tail is not at all visible, and the head is round.

THE HARTFORD HIGH SCHOOL TELESCOPE.

It is a pleasure to call attention to the recent step taken by the authorities of the Hartford High School, in securing an equatorial telescope of 9½ inches, clear aperture, a neat cut of which appears on the next page. Its focal length is 11 feet 4 inches; its declination circle is graduated on silver to 15′ and by vernier reads to 1′. The hour circle is graduated to single minutes, and reads by vernier to five seconds. It is mounted on a rectangular iron column, having a broad base projecting to the north, so as to bring the center of gravity, near the center of the base, which is below the floor of the observing-room for convenience. The driving-clock is placed in the opening near the top of the column, and is protected by glass doors. It is controlled by a double conical pendulum, the two balls of which are so connected together that each does its work in governing the movement of the telescope. When the clock is running, a continuous friction is given by leather pads pressing on a hardened steel disc. The friction is diminished or increased, as more or less resistance is given to the movement of the telescope. The pendulum balls are not attached to the levers operating the friction pads, but are, at all times, free to take their theoretical position, thus giving a uniform motion to the telescope under varying resistances. The clock communicates with the polar axis, by means of a worm, and a continuous worm gear, so that no trouble is caused by the worm running out, as is the case when only a segment is used. The driving weights are inside the column. For convenience in setting the instrument, each axis is geared one to four, to the handles shown in the cut, which being near the circles, enable the observer to direct the telescope to any star without touching the tube. Two handles extend to the eye-end of the tube, one communicating with the declination axis, and the other with the polar axis. To clamp the polar axis, the large part of the first handle shown in cut, is given a partial revolution. The slow motion in declination is then obtained by turning the small part of the handle.

The handle governing the clamp, and slow motion in right ascension works in the same manner, thus placing all clamps and slow mo-



HARTFORD HIGH SCHOOL TELESCOPE.

Object Glass 9½ inches Aperture, by ALVAN CLARK & SONS, Cambridge, Mass. Equatorial Mounting by WARNER & SWASEY, Cleveland, Ohio.

tions at the eye-end of the tube, and dispensing with all ropes and cords.

The hour-circle is provided with a movable pointer, which is carried by the driving-clock at the same rate as the circle, but independent of it, as its movement is continuous.

To set the pointer for the evening's work, it is only necessary to direct the telescope to any familiar star near the meridian, and clamp it in position, allowing the clock to carry it.

Then move the pointer till the index coincides with the figure on the circle corresponding with the star's right ascension. The clock will then carry it without further attention.

So much space has been given to these interesting details, because they will be new to most of our readers, and full of suggestion to all.

EDITORIAL NOTES.

Subscribers will please remember that our next issue will be for August.

We are fortunate in being able to present, this time, so full a series of observations and drawings of the Pons-Brooks' Comet, as that given by Professor H. C. WILSON, acting astronomer at Cincinnati Observatory. The work is skillfully done, and it will have special value in aiding astronomers to test new theories pertaining to the physical constitution of comets.

During the last year, Professor NEWCOMB visited in Europe, the observatories of Paris, Neuchatel, Geneva, Vienna, Berlin, Potsdam, Leyden, Strassburg, and the shops of the REPSOLDS, at Hamburg. The object of the visit was to collect information respecting the most recent improvements in astronomical instruments, and methods of observation. His official report to the Secretary of the Navy, contains a useful summary of observation for the attention of the practical astronomer, and it will be read by such with unusual interest.

Attention is called to the proper motion of LACAILLE, 8262, by Prof. HOLDEN, in the November number of the MESSENGER. It may be well to mention, that the micrometer measures of this and a companion star may be of some service in determining the amount and direction of the proper motion of the bright star which is B. A. C. 6814. FLAMMARION has included it in his *Catalogue des Etoiles Doubles et Multiples*, but there the later measures of BURNHAM and STONE, 1878—1881, are not given. As a double-star, it is known as H 2904.

By kindness of Prof. JOHN HEYWOOD, Otterbein University, Westerville, O., we are able to give our readers some interesting observations made by Prof. HENRY HARRISON in 1877, June 14, 8 P. M. They are as follows: "While engaged at drawings of the *Moon's* terminator, now 84 hours of age, I notice variations of brilliancy along the dark limb, or earth-shine so-called, which present curious characteristics; the light resembles the reflexion of a moving mirror, held in a strong light against the shadow side of a dark hall; streamers of light of a faint greenish-blue, seen to move along the limb, resembling somewhat the moving streamers often seen during a display of our terrestrial Aurora Borealis. (Perhaps optical illusion.) June 16th, 1877.—"Think I discover the same moving light on *Moon's* dark limb, as on the 14th inst., but much fainter." It seems to me that these observations are a strong confirmation not only of my observations, but of my explanation; as the same occurred to Mr. HARRISON.

THE OCTOBER OCCULTATION OF β CAPRICORNI.

There will be but one favorable occultation of this star for American observers during the remainder of the present year. This will occur on the evening of October 26th. Immersion will take place at Washington $9^h\ 19^m$; emersion, $10^h\ 17^m$; duration of occultation will be 58^m, the *Moon* being at its first quarter. This will be a good opportunity for again witnessing the phenomenon of Nov. 6th, 1883. I earnestly request that the occultation of the small 7th magnitude star that precedes *Beta* (on the same parallel) by 14^s be carefully watched. If the phenomenon of last November be repeated (which I do not doubt,) there will be an instantaneous diminution of the light of the star to a minute point—watch closely for this—which point will not be visible more than one, or one and one-half seconds. Probably before the occultation some of our large instruments will have proved the duplicity of the star, nevertheless, the occultation should be carefully watched.

E. E. BARNARD.

Mssrs. GILDERSLEVE and HOOPER, at the observatory of the former, observed a dark transit of *Jupiter's* first satellite, March 31 at $3^h\ 30^m$ "It was seen as a dark body on the edge of the south belt, and at that time was more easily seen than its shadow, the air being very unsteady. The satellite was within one-half hours of egress, while the shadow was about one-half hour inward on the *disc*. The satellite continued dark until off the planet.

The great red spot on the planet *Jupiter* is still visible. There has been scarcely any change in its dimensions, since observations were first made at the Dearborn observatory in Sept., 1879. During the present opposition, it may, possibly have become a little fainter than

it was last year, but when the seeing is first-class, it still shows a pale pinkish color. It has been stated in foreign journals that the spot had lost it outline, and became merged in a faint belt on the following end. This statement is erroneous Within a month past the outline of the spot has been seen sharply defined, and entirely separate from any belt. G. W. H.

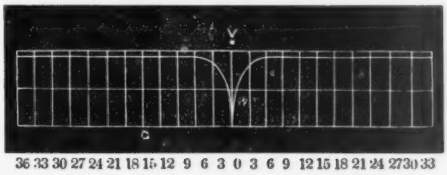
THE THREAD OF LIGHT ENCIRCLING VENUS.

NEWCOMB in his "Popular Astronomy" says:—

"In Dec. 1866 when *Venus* was very near her node at inferior conjunction and passed unusually near the line drawn from the earth to *Sun*, Prof. LYMAN of Yale, examined the crescent of the planet with a moderate sized telescope. He found that he could see the entire circle of the planet's disc, and an exceeding thin thread of light stretching around the side fartherest from the *Sun*."

At the inferior conjunction of *Venus* with the *Sun*, July 11 next, some keen eyes, blessed with favoring atmosphere, may repeat the observation narrated above, although the planet may not be so well situated. J. R. H.

The following cut is kindly copied by Mr. J. R. HOOPER, Baltimore, Md., from FLAMMARION'S *Les Etoiles et les Curiosites du Ciel.* It neatly represents the variation of the star *Algol* in time and stellar magnitude.



The upper horizontal line represents, in the figure, the brightness of a 2d magnitude star. The horizontal part of the next line below represents *Algol's* greatest brightness, and the curved part, the rapidity with which it runs down to a fourth magnitude. The vertical lines and the figures below represent hours, the zero showing the minimum of the star which according to FLAMMARION lasts only six minutes.

The only opportunity afforded in April to observe a minimum of. *Algol* was on the 28th, the lowest point of light being reached at $7^h.39^m$ 75th Meridian time. G. G.

PROGRESS OF THE ZONE-OBSERVATIONS OF STARS 1—9 MAG. OF THE GERMAN ASTRONOMICAL SOCIETY.

Kasan; Zone 80°—75°: The printing is begun and it gives the star places reduced to the beginning of the year. The reduction to 1875 is still to be made.

Dorpat; Zone 75°—70°: and *Christiania*; Zone 70°—65°:—The work for these Zones is nearly completed.

Helsingfors—Gotha; Zone 65°—55°: the printing is well advanced.

Cambridge (U. S.); 55°—50°: the printing has begun; the work of reduction to 1875.0 is about half-done. A certain number of stars require re-observation. The probable errors of a position are about $0^s.08$ and $0''.8$.

Bonn; Zone 50°—40°: the observations are not yet finished, although near to completion. The mean difference of R. A. of a star from two observations is about $0^s.08$ and $1''.1$. Investigations of the effect of the magnitude of a star on its deduced R. A. show a difference (faint *minus* bright) less than $+0^s.008$ in the mean.

Lund; Zone 40°—35°: the observations are finished.

Leyden; Zone 35°—30°: the work is nearly completed.

Cambridge (England); Zone 30°—25°: 38559 observations have been made from 1872 to 1883. 384 stars have not yet been observed once, 614 have been observed only once, the rest of the total number, 10691, twice or oftener.

Berlin; Zone 25°—20°: Dr. BECKER's observations are completed. Observations on 13 nights of 247 stars show that fainter stars are observed later by $0^s.007$ for a magnitude.

Berlin; Zone 20°—15°: Dr. AUWER's has long since completed the observations. The reductions are not completed.

Leipzig; Zone 15°—5°: the observations are nearly completed, for the Zone 15°—10°; and those for 10°—5° are in progress.

Albany; Zone 5°—1°; the observations are completed, and the reductions very far advanced.

Nikolaieff; Zone +1°—2°: the observations are still in progress.

CATALOGUE OF 6,000 STARS.

Professor SCHEVING writes that Gottingen Catalogue of 6,000 stars is in process of preparation for printing. For account of it see Gottinger *Nachrichten*, 1864, July 13.

During the night of May 17. Prof. SWIFT, of Warner Observatory, discovered five new nebulæ, three of which were near α *Henculis*. Prof. SWIFT already has a large list of new nebulæ which he hopes soon to publish.

DETERMINING STARS FOR THE SOUTHERN ZONES OF THE ASTRONOMISCHE GESELLSCHAFT.

These 303 stars are being observed at various observatories, as follows:

Cape of Good Hope:—The observations are finished and each star has been observed at least 12 times. The results of observation are all reduced, and for the final publication there are needed investigations of the flexure, the latitude, the refraction, the personal equations of the observers depending (*a*) on the star's magnitude, (*b*) on its declination. The division errors for each 1° have been investigated. The circle is not reversible. The flexure is to be investigated by means of collimators made specially for the purpose by TROUGHTON & SIMMS. Each collimator is furnished with a reversing apparatus and a level, and the horizontal point can thus be determined, either north and south. Combining these horizontal points with nadir-points will determine whether the flexure is the same looking north and south. The latitude is to be determined from observations of Circumpolar stars, at both culminations (already observed in 1880, '81, '82, '83.) The declinations of these stars are to be determined by observing their azimuths at greatest elongations E. and W., with the 3-foot theodolite of the India Survey. South stars culminating at zenith-distances, equal to those of the Circumpolar stars, are to be observed by TALCOTT'S method.

For the refraction the Cape has observed a number of north stars, (near the zenith of Leyden), and zenith stars (near the horizon of Leyden,) which have also been observed at Leyden. A discussion of these declinations is now in progress.

For *eliminating* personal equation depending on the direction of the star's motion, each star has been observed over half the wires in the usual way, and over the other half through a reversing prism.

All the observers make the clock *slower* when the stars move across the field from left to right.

Leyden Observatory:—Since 1881, 427 observations have been made, and 1124 in all. 165 of the 303 stars have been observed once, or oftener.

Melbourne Observatory:—The observations will be begun in 1883.

Sydney Observatory:—Sydney also proposes to observe these stars.

Naples Observatory:—The observations will be begun in January, 1884.

Washburn Observatory:—The observations were begun in May, 1884.

Minor Planet No. 236 was discovered April 26, by J. PALISA of Vienna, Austria. It is of the 12th magnitude.

COMET III, 1858.

I have received an autograph letter from Prof. L. SCHULHOF, of Paris, announcing that he had ascertained that comet III, 1858, is a periodic not only, but one of the short period of 6½ years. He inclosed a hypothetical finding ephemeris extending, however, only from April 26 to May 8. A continuation of it has just reached me through *Science Observer*, Circular No. 45. I had, however, already sent to several comet-seekers a copy of the one sent to me.

Among other statements in M. SCHULHOF's interesting and instructive letter he says "I have not yet determined, because of lack of good positions of comparison stars, the limits of mutability in its time of revolution, but it will in every case be very great; nevertheless I think it will be an object worthy the attention of comet-seeking astronomers to search for this interesting comet, by the aid of my ephemeris. If it appears between Dec. and Aug., it can be re-found, but if on the contrary between Aug. and Sept., search will be fruitless, on account of its too great distance from the earth. Its *third* appearance (of course he means fourth) since 1858 may be already passed, but as its time of revolution is about 6½ years, there are still chances of re-finding it this year till August, and from Dec. to Aug., 1885."

As a periodic comet is an interesting affair, compared with one whose period, if it is one, is unknown, I hope that comet-seekers will devote at least a share of their time to a systematic and thorough search for this comet, which, if found, will increase the number of known periodic comets to 14.

This comet was discovered by H. P. TUTTLE, then of Harvard College Observatory, May 2, 1858, on the very day of its perihelion passage. Its motion is direct. In consequence of its great perihelion distance, (about 111,000,000 miles) it can never be a bright one.

LEWIS SWIFT.

Warner Observatory, May, 17, 1884.

SCHOENFELD'S DURCHMUSTERUNG, FROM—2° TO—23°.

At the Vienna meeting of the German Astronomical Society. Dr. SCHOENFELD gave an account of the progress of his work since the Strassburg meeting.

699.3 hours of R. A. with 363351 star-positions have been offered from the beginning. The principal catalogue now contains 113706 stars between—2° and—23° and 1161 stars near these limits. In 21^h *i. e.* from 9^h 0^m to 6^h 0^m the work is completed.

It is expected to begin the printing of the principal catalogue in May or June, 1884. Probably some 40,000 stars brighter than 9.1 mag. exist in the region.

DARK TRANSIT OF JUPITER'S 4th SATELLITE

The following interesting paragraph is from the pen of JOHN H. EADIE, Bayonne, N. J.

I was much interested in the account given in the May number of THE SIDEREAL MESSENGER of the dark transits of the third and fourth satellites of *Jupiter*, as seen by Professor DAVIDSON and Messrs. BURCKHALTER and HILL on the 15th of January and 24th of February last. At the March meeting of Royal Astronomical Society of England, a similar transit of the fourth satellite was mentioned by Capt. NOBLE, as seen on the 12th of March. I have not, however, yet seen any account of the transit of the fourth satellite on the 3d of December, 1883. At $11^h\ 15^m$ P. M. of that day (local time), I saw this satellite, and the shadow of the third, during a short observation with a $3\frac{1}{4}$-inch aperture and power of 100, both in transit at the same time. The satellite was a little to the east and south of the shadow, and was on the bright band adjoining the bright belt, south of the equator, and although, of smaller size, was fully as black as the shadow of the third. I did not have time to watch this remarkable phenomenon for more than 15 or 20 minutes, but as others more favorably situated for observation than I was, may have seen better the beginning and ending of this transit, it would be interesting to hear from them on this subject.

DEFINITIVE DETERMINATION OF COMET ORBITS.

For many years Dr. BRUHNS kept a general out look over the matter of the definitive determination of comet orbits, and his annual papers in the V. J. S. der Astron. Gesell. were of great value in directing attention to the cases of comets whose orbits needed attention, in indicating the sources from which observations could be taken, and by preventing unnecessary duplication of such work through correspondence. Dr. WEISS Director of the Vienna observatory has now agreed to fill the same place and those intending to occupy themselves with this branch of computation will do well to address themselves to him.

An observer desires a good second-hand transit instrument, aperture about two inches, focal length 2 or $2\frac{1}{2}$ feet. Any person wishing to sell such an instrument, is asked to give terms and particular description of it to the publisher of the "MESSENGER." A photograph of the instrument also would be desirable.

Messrs. WARNER and SWASEY, of Cleveland, O., have completed the great dome for the new Mc Cormick Observatory at the University of Virginia. It is hemispherical in shape and is 45 feet in diameter. The makers will superintend putting it in place, which probably will be accomplished by the first of this month.

"L'Astronomie" the *French Monthly Review* of Popular Astronomy, for May, 1884, contains the following articles:

Formation of the Solar System, (by M. Faye); Fluctuations in Solar Activity, (C. Flammarion). The double Star, 85 *Pegasi*; Earthquake statistics, (M. C. Detaille); Earthquakes (M. Rey de Morande), and a communication to the Academy of Sciences on the singular variations in the nucleus of the Pons-Brooks' Comet.

M. Faye's article, like all that he has written, is intensely interesting.

Starting with the examples of well known annular and spiral nebulæ, like that in *Lyra* and in *Leo* (H. I. 56), and which show the arrangement of the nebulous matter into a vast spiral, M. Faye traces the possible method of the creations of systems, such as our own.

This method he believes to have been by condensation and rotation. The conclusion we give in a translation of M. Faye's own words.

"It was evident that the planets comprised in the central region, the most dense part of the nebula, from *Mercury* to *Saturn*, were formed under the empire of the first law, while the *Sun* did not yet exist, or had not yet acquired a preponderating mass; and that the planets comprised in the exterior region, much the larger, were formed when the *Sun* was already in existence. If then we should discover a satellite of *Venus*, it will be direct. If we should discover a planet beyond *Neptune*, its rotation and its satellites would be retrograde.

There is seen finally, a consequence of high interest: viz. The *Earth* is much older than the *Sun*. If it were otherwise, as La Place thought, if its formation had been posterior to that of the *Sun*, all would be changed in the aspect of the heavens. The stars would rise in the west, and set in the east. The *Moon* would have a retrograde movement, like that of the satellites of *Uranus* and *Neptune*." The whole article is of much interest, though too long for our pages.

Among the "Academy" communications, is one by M. Ch. Trepied, on the Pons-Brooks' Comet, with a sketch showing the "hour-glass" appearance of the nucleus, on the 19th of January. This change had already been observed on the 13th, with the same general characteristics. In the *Scientific News*, M. L. Descroix gives a Barometric Chart of great interest, taken at the Montsouris Observatory, on the 26th, 27th, and 28th of August, 1883. These charts show sharp indentations corresponding with the Krakatoa eruptions, beginning at 8 P. M., on the 27th, and at 4:30 A. M., on the 28th, the indentations are exceedingly deep and abrupt, showing a sharp decrease of pressure.

The article upon *Saturn* is beautifully illustrated. "In the Observatory of Nice, Messrs. Perroten and Thollon, had some curious observations of the rings, by the aid of an equatorial of 14 inches diameter. On the 16th of March, the exterior ring appeared to be com-

posed of three distinct rings, the largest at the interior; the narrowest at the exterior, but with slight diffences in size. In moments of most favorable definition, these rings themselves presented *Striæ* toward the *Ansaæ*, which appeared to consist of numerous divisions.

The division nearest the planet was seen throughout nearly the whole extent of the ring. It was at a distance from the inner edge of the ring, equal to a little more than one-third of the whole breadth of the ring. This was certainly not Encke's division, which was about center of the exterior ring; as we see in the sketches of DE LA RUE, BOND, and TROUVELOT.

Uranus has been seen by M. PERROTEN, marked with spots resembling those of *Mars*. The edges of the disc were sharply defined. There was a white spot which appeared to mark the pole.

Neptune as seen in Jamaica, by MAXWELL HALL, presented periodic variations in brightness, from which was deduced a daily rotation of $7^h\ 55^m\ 12^s$.

LENGTH OF METEORIC SHOWERS.

Mr. DENNING, who is authority on the subject of Meteoric Astronomy, contends that some of them are of several months duration. Whether this be so or not, I know that the August *Perseid* shower has for several years at least lasted 20 days. As a relaxation for a wearied eye, while comet-seeking I usually watch for meteors, and for the last three or four years I have noticed that this celebrated shower has commenced on July 21—22, and continued until Aug. 10—11, ending abruptly at the latter date.

The *Perseids* have some peculiar characteristics which distinguish them from all others, so that almost without exception it can be decided from their appearance whether they belong to that radiant or not. They are neither very large or bright, but their visible paths are unusually long, and appear to move at about the same velocity. A family likeness in fact seems to pervade them all. I also have noticed that those which appear before the shower proper(Aug. 10—11,) have a westerly motion. They are not numerous, but they all have a radiant agreeing exactly with that of the August shower, and I have no doubt that they belong to the same meteorical family, As no SIDEREAL MESSENGER is to be published in July, I wish in the number for June to call the attention of meteor observers to this fact.

WARNER OBSERVATORY, Rochester, May 19, 1884. LEWIS SWIFT.

In the *Boletin* of the Mexican Department of Agriculture, etc., No. 41, is published a brief account of the telegraphic determination of the San Marcos, state of Guerrero. The following are the co-ordinates:—Lat. 16° 47′ 31″.4, Long $6^h\ 37^m\ 28^s.34$ west of Greenwich. M. W. H.

PLANETS FOR JUNE. (CENTRAL TIME.)

During this month *Mercury* is a morning star, rising before the *Sun*, and reaching greatest western elongation, June 12; June 14, diameter 7″.8.

Venus remains an evening star, having greatest brilliancy June 3; June 14, diameter 43″.8. June 18, stationary. June 24^d 7^h, in conjunction with the *Moon*. June 5, sets 10^h 46^m; 15, sets 10^h 11^m; 25, sets 9^h 20^m.

Mars, June 14, diameter 6″.2. June 5, sets 12^h 20^m; 15, sets 11^h 52^m; 25, sets 11^h 23^m, evening.

Jupiter is in conjunction with the *Moon* June 25^d 10^h, morning. June 11, diameter 31″.4; June 5, sets 11^h 3^m; 15, sets 10^h 29^m; 25, sets 9^h 56^m, in the evening.

Saturn is in conjunction with the *Sun*, June 3^d 3^h. June 11, diameter 15″.6. June 5, sets 7^h 38^m; 15, sets 7^h 5^m; 25, sets 6^h 32^m, evening.

Uranus is an evening star, in conjunction with the *Moon* 28^d 11^h.

Neptune crosses the meridian several hours after sunrise, and so is poorly situated for observation, even with a good glass.

M. E. B.

From the *Anales del Ministerio del Fomento* of the Mexican states, Vol. VII, and from other sources we learn that the National Astronomical observatory is located at Chapultepec, a suburb within easy reach of the city of Mexico. The location is a picturesque one, and the neighboring palace is a favorite residence of the presidents of the states. It is elevated, has a good rock foundation, is fairly retired from commercial activity, and is an excellent place for the location of an observatory, though, there has been some discussion on the question of changing its site. The Military college is already at Chapultepec, and the proposal to change the site is offset by a proposal to locate other government institutions of similar character, (meteorogical, magnetic, geodetic, etic.,) at the same place. The geographical co-ordinates of Chapultepec may be found in the American Ephemeris.

The institution was founded by a decree of the general government December 18, 1876, with the co-operation of General Diaz, President, and considerable enthusiasm among the intelligent classes. Sr. Anguiano was made, and continues, director. The first work was done May 5, 1879, and the first permanent instrument mounted August 27, of the same year, at the time of this report (the volume is dated 1882, but, has been but lately received,) the instruments mounted and used were a Zenith telescope of $0^m.076$ aperture, an altazimuth of $0^m.083$ aperture, (both by Troughton and Simms), a sidereal clock for which they are indebted to a Mexican manufacturer, Sr. Vazquez,

two chronometers, and a chronograph. It does not appear whether Sr. Vazquez made, or simply gave them the clock.

The outfit is soon destined to be increased by a meridian circle, and a transit by Ertel, and a 15 inch-equatorial by Grubb, also a 6-inch equatorial by the same maker. They have a small transit, unmounted, and a meteorological outfit.

A chart gives the plans and profile of the building of the observatory, as projected. It is to be 65 meters long, and faces south. The central part is 20 meters front by 32 deep, and is two stories high. It is surmounted by the great dome. It contains the pier and its octagonal gallery and numerous offices, library, work-rooms, and director's and servants' rooms. On each side is a wing, 22 meters long, with a dome at each end, and there is a smaller extension with a dome to the north. The east wing appears to be completed; the stage of progress of the others we are unable to gather from the report. M. W. E.

NEW ASTRONOMICAL MAGAZINE.

The *Bulletin* is assured of the active co-operation of the French Astronomers, who can publish these regularly, either the observations or the notices, or memoirs which they are obliged to send, first to the journals of foreigners. The common meaning (or purpose) between the different observatories, gives them further a valuable facility for arranging their work after the manner the most useful for the progress of Science. Finally the *Bulletin* receives also with eagerness, the observations and the articles which they desire foreign astronomers to send to them.

The Observatory of Paris will support with all its power, all the useful and fruitful work, with the direction of M. Lisserand, with the concurrence of M. M. G. Bigourdan, O. Callandreau and R. Radan, and we hope that it will contribute to the development of Science in general, and French Astronomy in particular.

Subscriptions and orders for the MESSENGER not previously acknowledged, and those received during the month of May.

Public Library, Boylston St., Boston, Mass., ordered by Messrs. W. B. Clarke and Carruth; Minnesota Academy of Science's, Minneapolis. Minn., ordered by Judge N. H. Hemiup, William A. Haren, 1400, Hickory St., St. Louis, Mo., Garrett P. Serviss, 8, Meddagh St., Brooklyn, N. Y., Ellen A. Hayes, Wellesley College, Wellesley, Mass., A. Henry Ferguson, 6 Dana Place, Roxbury Station, Boston, Mass., Dr. Wm. U. Herron, Alleghany City, Pa., Capt. C. A. Curtis, Shattuck School, Faribault, Minn., Professor H. C. Wilson, Cincinnati Observatory, Mt. Lookout, Ohio, A. Lancaster, Librarian, Royal Observatory, Brussels, Belgium, Oharles S. Wells, Portland, Oregon, Messrs. E. Steiger & Co., Publishers, (two copies), 25 Park Place, New York.

BOOK NOTICES.

Empirical and Rational Psychology, Embracing Cognitions, Feelings, Volitions; by A. Schuyler, LL. D., President of Baldwin University. Cincinnati; Van Antwerp, Bragg & Co. 12 mo. pp. 484.

President Schuyler is primarily a mathematician, having published a series of mathematical works, and his book on Psychology shows the mathematician in its methods and processes. In this way the work differs considerably from the ordinary text-book on this subject. It is severely formal and concise; but the reader whose interest is not thereby compelled, or the student who has an enthusiastic teacher to supplement the book, cannot fail to gain from it a well-defined knowledge of the mental processes.

Dr. Schuyler introduces his discussion of the Intuitions at the outset, as the axioms, the fundamental principles, for subsequent investigations. This seems to us wise; for, though this is one of the difficult subjects, the mind that cannot grasp it, is not ready for the study, and a knowledge of the Intuitions helps greatly in understanding the other mental processes.

Small as the book is for a complete presentation of this complex subject, considerably more than one-third is given to a course in Logic—an ample course for those who have not taken up the subject by itself. Especially valuable to the mature reader are the opinions of the leading philosophers, which the author quotes freely and discusses at some length. C. H. C.

A New Political Economy, by John M. Gregory, LL. D., Cincinnati; Van Antwerp, Bragg & Co. 12 mo. pp. 394.

A very hopeful indication of the present time is the increasing interest that is felt and shown in questions of political science and political philosophy. Once entirely ignored in our college curricula, or put off with a little formal instruction, by some overworked professor, in a department not at all related to them, history and political science are coming to receive the attention they deserve, and no subjects excite more general interest or, are attacked with more energy than these.

Dr. Gregory has given, as the results of many years of teaching and thinking on Political Economy, a clear and in the main, sound presentation of the principles of this subject. Rejecting the almost universally accepted definition, "The Science of Wealth," he treats of "Wants, Work, Wealth;" though the difference between him and other economists in this regard, is more formal than real. We find the topics of the ordinary text-book treated in an interesting manner, and illustrated by diagrams, which, though, artificial, may help to an understanding of the true relations of the parts and divisions. On the Tariff question, Dr. Gregory favors protection, though his argument is calm and fair; with this exception we can commend the work. C. H. C.